Question 3

(a) On the axes provided, **construct** and **label** a graph showing the results for the three samples.
(1point each; 3-point maximum)

- Orientation of axes is correct: x-axis is time/minutes, y-axis is light transmittance/%
- Data are plotted correctly (one misplaced data point is permissible)
- Graph is accurate: must include proper scaling and correct labels and units of measurement and key

(b) Identify and explain the control or controls for this experiment.
(1 point each; 3-point maximum)

- Sample 1 is the control
- Sample 1 is in the light and has permissive temperature/functional structures (membranes, proteins, enzymes, etc.)
- Control is the basis for comparison to treatment effects (can award even if wrong sample was identified as the experimental control)
- Reliability of data/design: identical procedures, reagents, measurements, adequate sample size (must identify at least two)

(b) **Discuss** how electrons are generated in photosynthesis and why the three samples gave different transmittance results.
(1 point each; 6-point maximum)

- Chlorophyll (photosystem, reaction- or photo- center; "chloroplast" alone is not sufficient) is the link between light (photons) and the generation of electrons
- Water is the source of electrons (photolysis, oxidation, splitting)
- Electron generation, not simply photosynthesis, is proportional to DPIP reduction light transmittance
- Decreasing light availability decreases the quantity of electrons that will be generated, and/or vice versa
- Boiling disrupts functional structures (membranes, denaturation of proteins/enzymes, etc.; "chloroplast" alone is not sufficient)

Elaboration (1 point only)
photosystem II and/or I/Z-scheme
data analysis